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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 09/837,503 Confirmation No. 8044
Applicant : Vincent M. Callaghan et al
Filed : April 18, 2001
TC/A.U. : 1764
Examiner : Basia Anna Ridley

Docket No. : 01-104
Customer No. : 34704

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313

APPEAL BRIEF UNDER 37 CFR 1.192

Dear Madam:

This Appeal Brief is submitted following the Notice of Appeal filed July 9, 2004.

(1) **Real party and interest.** The real party in interest in this Appeal is the Assignee of record, namely, UTC Fuel Cells, L.L.C.

(2) **Related appeals and interferences.** There are no known appeals and/or interferences related to the present appeal.

(3) **Status of claims.** The case contains claims 1 - 17 of which claims 12 - 16 have been canceled and withdrawn from consideration. This leaves claims 1 - 11, and 17 pending. Of these claims, claim 6 has been allowed, while claims 1 - 5, 7 - 11 and 17 stand rejected over prior art. The appealed claims are claims 1 - 5, 7 - 11 and 17.

A response to final rejection under 37 CFR 1.116 was mailed on April 12, 2004. This response to final was not entered by the Examiner, indicating an Advisory Action mailed May 3, 2004, that the amendment raised new issues and would require further consideration and/or search. It is interesting to note that the

only amendment made in the un-entered response was to amend the specification to point out that the abbreviation "PPH" stands for pounds per hour, clarification of which had been requested by the Examiner. It is unclear to the undersigned how entry of this amendment would raise new issues. Nevertheless, since this abbreviation is well understood by a person of ordinary skill in the art, the appeal can certainly proceed without entry of the subject amendment.

(5) **Summary of Invention.** The invention relates to a fuel cell system and, more particularly, a fuel processor for a fuel cell system which converts hydrocarbon fuel into a high temperature reformed gas containing hydrogen, carbon dioxide and carbon monoxide. A first conduit is provided for communicating the reformed gas to a shift converter and a second conduit is provided for communicating the gas stream from the shift converter to the fuel cell. A water source is communicated with either or both of the first and second conduits, with water feed means for feeding water from the water source to the first and/or second conduits for cooling at least one of the reformed gas and the gas stream, respectively, to a desired temperature. The means for feeding water from the water source in a controlled manner is shown in Fig. 1 as water source 28 with line 42 to a series of valves 46 for injecting the water along conduits 18, 22 as may be desired.

A selective oxidizer 24 can advantageously be positioned between the shift converter 20 and the fuel cell 30, and located downstream of where the water feed means feeds water to the first and/or second conduits.

Control means are provided for controlling the feed of water to the conduits, and the control means is preferably adapted to sense the temperature of the reformed gas and gas

stream, respectively, and to feed water to at least one of the first and second conduits in response to the sensed temperature.

In accordance with a further aspect of the invention, means are provided for collecting water from the fuel cell and recycling at least a portion of the collected water back to the water source.

The control means preferably includes at least one solenoid valve which opens and closes in response to the sensed temperature.

The water feed means preferably includes means to atomize the water.

Still further, a high surface area material can be used as a packing in at least one of the first and second conduits, and the water can be fed to this material.

Each of the foregoing features of the invention is set forth in one of the claims which stands rejected upon the present appeal.

(6) Issues.

I. Whether U.S. Patent No. 4,473,622 teaches each and every feature set forth in claims 1, 2, 5 and 11.

II. Whether U.S. Patent No. 4,473,622 to Chludzinski et al is properly combined with U.S. Patent No. 4,042,016 or U.S. Patent No. 3,651,641 to reject claims 3, 4, 7 and 8 as obvious.

III. Whether U.S. Patent No. 4,473,622 to Chludzinski et al can be combined with U.S. Patent No. 4,530,886 to Sederquist to arrive at a rejection of claims 9 and 10 as obvious.

IV. Whether U.S. Patent No. 4,473,622 to Chludzinski et al can be combined with U.S. Patent No. 3,982,962 to Bloomfield to arrive at a rejection of claim 17 as obvious.

(7) Grouping of Claims

Claims 1 - 5 each stand separately, and do not stand or fall together, since each of these claims adds a different feature of the present invention, and these different features will be discussed below in terms of their complete and total absence from the prior art.

Within the grouping of claims 7 - 11, claims 7, 8 and 11 all stand or fall separately, as does the grouping of claims 9 and 10 which stand or fall together.

Finally, claim 17 also stands separately from the remainder of the claims.

(8) Argument. Issue I.

Chludzinski et al clearly does not teach each and every feature of claims 1, 2, 5 or 11 as asserted by the Examiner. Thus, this rejection is in error and should be reversed.

Turning to claim 1, claim 1 is drawn to a fuel cell system and requires, among other elements, a water feed means for feeding water from the water source to at least one of the first and second conduit means in a controlled manner for cooling at least one of the reformed gas and gas stream, respectively, to a desired temperature. This claim element is set forth in means plus function format and is properly interpreted following the requirements of 35 U.S.C. 112, 6th paragraph. Thus, this limitation is properly interpreted as covering the structure disclosed in the specification for performing the claimed function, and structures which are equivalent thereto.

The structure disclosed in the specification for feeding water from the water source to the conduit means in a controlled manner for cooling to a desired temperature includes a water feed line 42 to a particular conduit 18, 22, and the feeding in a controlled manner is carried out by mixing liquid water with

the stream. This liquid water is indicated in the specification as the vehicle for cooling, as the appreciable and important portion of the cooling is done through evaporation of the liquid water.

In meeting this structure, the Examiner pointed to Chludzinski and the water vapor transporting membrane positioned between two different lines of the system. This membrane is said to pass water vapor from the anode exhaust to the higher temperature reformatre stream thereby drying the hydrogen and partially humidifying the reformatre.

Thus, the disclosure of Chludzinski is a membrane which transports water in vapor state from one line to another. No mechanism is disclosed for making this transport in a controlled manner. It is respectfully submitted that this disclosure is clearly not within the scope of the limitation of claim 1. Specifically, claim 1 when properly interpreted under 35 U.S.C. 112, 6th paragraph is not met by a water vapor transport membrane. Chludzinski may inherently cool the higher temperature stream, but in a different and non-equivalent manner to that set forth in the specification. Further, nothing in Chludzinski discloses or suggests controlling the amount of water based upon temperature of the stream into which the water is being added.

Based upon the foregoing, Chludzinski clearly fails to meet each and every limitation of independent claim 1, and therefore, does not anticipate same. Reconsideration of the rejection holding anticipation is therefore respectfully requested.

Dependent claim 2 calls for the water added to the reformed gas to set a desired oxygen/carbon ratio for the shift converter. Any water transported with the structure of Chludzinski, it is respectfully submitted, would be problematic

in terms of attempting to set the desired oxygen/carbon ratio for the shift converter as set forth in claim 2.

In connection with claim 5, it is respectfully submitted that Chludzinski et al clearly fails to disclose means for collecting water from the fuel cell and recycling at least a portion of the collected water to the water resource. This rejection, too, is in error as the reference fails to disclose each and every feature of claim 5 combined with independent claim 1.

Turning to claim 11, claim 11 further modifies the means for feeding water structure of claim 1 to indicate that water is fed to both the first and second conduits. Chludzinski et al clearly fails to disclose the subject matter of this element of the claims, in similar fashion to that set forth in connection with claim 1 above. Specifically, Chludzinski et al clearly does not disclose the structure for accomplishing this function which is set forth in the specification, or any equivalent thereto, and therefore fails to meet this claim limitation under 35 U.S.C. 112, 6th paragraph. Claim 11 is therefore allowable over the art of record, and this rejection should be reversed.

Issue II

The subject matter of claims 3 - 4 and 7 - 8 is not obvious based upon Chludzinski et al in view of either Boochever et al or Ginter. Claim 3 calls for the water feed means to include control means for controlling the feeding of water to at least one of the first and second conduit means, and claim 4 specifies that the control means senses temperature of the reformed gas and gas stream, respectively, and feeds water to the first and second conduits based upon the sensed temperature.

The secondary references relied upon by the Examiner in meeting the subject matter of claims 3 and 4 is drastically

different and unrelated to the primary reference. Boochever et al was drawn to an environmental humidification and cooling system which includes an ultrasonic spray nozzle.

Humidification in this system is effected by spraying atomized water with the ultrasonic nozzle into the suction chamber of a fan.

In a different direction, but equally strikingly different, Ginter is drawn to an engine system and thermogenerator therefore. Specifically, Ginter is drawn to a combustion engine and uses a water line to supply atomized water to the combustion chamber of that device.

It is respectfully submitted that a person of ordinary skill in the art would not consult either Boochever et al or Ginter in any way in connection with modifications to be made to the Chludzinski et al reference, and especially not for modifications to be made in connection with the control means for controlling feed of water to the first and second conduits, and the further function wherein the controls means senses temperature as set forth in claim 4. Thus, it is respectfully submitted that the rejections of claim 3 and 4 is fundamentally flawed as based upon hindsight reconstruction and inappropriate combination of references, and should be reversed.

As to claims 7 and 8, each of these claims recites subject matter, specifically a solenoid valve for the control means and means to atomize water as part of the water feed means, respectively. These claims, likewise, are said to be met by the combination of Chludzinski et al with either Boochever or Ginter as discussed above. It is respectfully urged that this combination is fundamentally in error, and this rejection should be reversed.

Issue III

The Examiner concedes that Chludzinski et al does not disclose the inclusion of a packing of high surface area material, with water being fed to the material. Of course, Chludzinski et al likewise must not disclose what the material is, by definition.

The Examiner instead cites the Sederquist patent as teaching that the efficiency of humidification of a gas stream can be increased by using a packing of high surface area material with water being fed into the material. This rejection fails to meet the subject matter of claims 9 and 10, respectively, by clearly still failing to meet the limitations of main claim 1 in connection with means for feeding water, and further in that Sederquist, does not contain any teaching which would lead one of ordinary skill in the art to be motivated to combine the teachings pointed out by the Examiner from Sederquist with the primary reference to Chludzinski et al. The rejection of these claims is therefore also in error and should be reversed.

Issue IV

In connection with independent claim 17, the Bloomfield reference is used by the Examiner to support teaching of a selective oxidizer as set forth in the additional limitation of independent claim 17. It is respectfully submitted, however, that Bloomfield contains no teaching whatsoever which cures the deficiency in the base rejection drawn to means for feeding water, which clearly is not met in the Chludzinski et al. reference. Further, this deficiency is not cured by the Bloomfield reference. Thus, the rejection of claim 17 is likewise in error and should be reversed.

(9) Conclusion

Based upon the foregoing, it is clear that the rejections of record which have been made final by the Examiner are in error and should be reversed. Further, the claims as currently pending are submitted to be patentable over all art of record, and allowance of the application is therefore respectfully and earnestly solicited.

An appendix containing the claims on appeal is attached.

The fee for filing an Appeal Brief is enclosed herewith. This Brief is also submitted in triplicate.

It is believed that no additional fee is due. If any fee is due, however, please charge same to Deposit Account No. 02-0184.

Respectfully submitted,
UTC Fuel Cells, L.L.C.

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I, Marian R. Capelli, hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop Appeal Brief-Patents "Commissioner for Patents" P.O. Box 1450, Alexandria, VA 22313-1450 on October 12, 2004

Marian R. Capelli

APPENDIX

1. A fuel cell system comprising a fuel processor for converting a hydrocarbon fuel into a high temperature reformed gas containing hydrogen, carbon dioxide and carbon monoxide, first conduit means for communicating the reformed gas to a shift converter located downstream of the fuel processor for further converting the reformed gas to primarily a hydrogen and carbon dioxide containing gas stream, second conduit means for communicating the gas stream to a fuel cell downstream of the shift converter for reacting the hydrogen in the gas stream, a water source, and water feed means for feeding water from the water source to at least one of the first and second conduit means in a controlled manner for cooling at least one of the reformed gas and gas stream, respectively, to a desired temperature.

2. A fuel cell system according to claim 1, wherein the water added to the reformed gas sets the desired oxygen/carbon ratio for the shift converter.

3. A fuel cell system according to claim 2, wherein the water feed means includes control means for controlling the feeding of water to at least one of the first and second conduit means.

4. A fuel cell system according to claim 3, wherein the control means senses the temperature of the reformed gas and gas stream, respectively, and feeds water to at least one of the first and second conduits, respectively, in response to the sensed temperature.

5. A fuel cell system according to claim 1, further including means for collecting water from the fuel cell and

recycling at least a portion of the collected water to the water source.

6. A fuel cell system comprising a fuel processor for converting a hydrocarbon fuel into a high temperature reformed gas containing hydrogen, carbon dioxide and carbon monoxide, first conduit means for communicating the reformed gas to a shift converter located downstream of the fuel processor for further converting the reformed gas to primarily a hydrogen and carbon dioxide containing gas stream, second conduit means for communicating the gas stream to a fuel cell downstream of the shift converter for reacting the hydrogen in the gas stream, a water source, and water feed means for feeding water from the water source to at least one of the first and second conduit means in a controlled manner for cooling at least one of the reformed gas and gas stream, respectively, to a desired temperature, wherein the water added to the reformed gas sets the desired oxygen/carbon ratio for the shift converter, further including at least one selective oxidizer, between the shift converter and the fuel cell, and located downstream of where the water feed means feeds water to the second conduit means.

7. A fuel cell system according to claim 4, wherein the control means further includes at least one solenoid valve which opens and closes in response to the sensed temperature.

8. A fuel cell system according to claim 3, wherein the water feed means includes means to atomize the water.

9. A fuel cell system according to claim 2, wherein at least one of the first and second conduit means includes a packing of high surface area material and the water is fed to the material.

10. A fuel cell system according to claim 9, wherein said high surface area material is selected from the group consisting

of ceramic pellets, steel wool, reticulated ceramic foam, metal foam, and honeycomb monoliths.

11. A fuel cell system according to claim 2, wherein water is fed to both the first conduit and the second conduit.

12-16. (cancelled) .

17. A fuel cell system, comprising:

a fuel processor for converting a hydrocarbon fuel into a high temperature reformed gas containing hydrogen, carbon dioxide and carbon monoxide;

first conduit means for communicating the reformed gas to a shift converter located downstream of the fuel processor for further converting the reformed gas to primarily a hydrogen and carbon dioxide containing gas stream;

second conduit means for communicating the gas stream to a fuel cell downstream of the shift converter for reacting the hydrogen in the gas stream; and

water feed means for feeding water to at least one of the first and second conduit means in a controlled manner for cooling at least one of the reformed gas and gas stream, respectively, to a desired temperature; and
at least one selective oxidizer positioned between the shift converter and the fuel cell, and located downstream of where the water feed means feeds water to the at least one of the first and second conduit means.